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Question Paper Code: 53705

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Third Semester

Mechanical Engineering

15UME305 - ENGINEERING MECHANICS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A force is completely defined when we specify CO1- R
(a) Magnitude (b) Direction (c) Point of application (d) All of the above
2. Forces are called coplanar when all of them acting on body lie in CO1- R
(a) One point (b) One plane (c) Perpendicular planes (d) Different planes
3. If a rigid body is in equilibrium under the action of three forces, then CO2- R
(a) the lines of action of these forces meet in a point (b) these forces are equal
(c) the lines of action of these forces are parallel (d) Above (b) and (c)
4. Fixed Support has _____. CO2- R
(a) One Horizontal Reaction (b) One Vertical Reaction
(c) One Rotational Reaction (d) All of the Above
5. The center of gravity of a uniform lamina lies at _____. CO3- R
(a) The center of heavy portion (b) The bottom surface
(c) The midpoint of its axis (d) All of the above
6. The calculation of the moment of the body due to the loadings involve a CO3- R
quantity called _____.
(a) Moment (b) Inertia (c) Rotation (d) Moment of Inertia

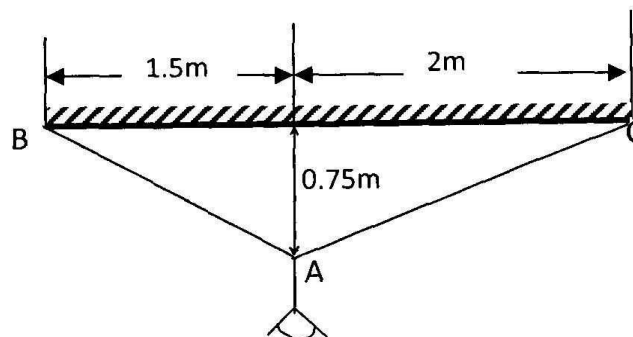
7. A car is moving with a velocity of 20m/s. The car is come to rest after 6seconds. Find acceleration CO4- R
- (a) 0 m/s^2 (b) 3.33 m/s^2 (c) -3.33 m/s^2 (d) 20 m/s^2
8. The unit of angular acceleration is CO4- R
- (a) N-m (b) m/s (c) m/s^2 (d) rad/s^2
9. The friction experienced by a body, when in motion, is known as CO5- R
- (a) Rolling friction (b) Dynamic friction (c) Limiting friction (d) Static friction
10. The co-efficient of friction depends upon CO5- R
- (a) Nature of surfaces (b) Area of contact
- (c) Shape of the surfaces (d) All of the above

PART – B (5 x 2= 10 Marks)

11. State “Parallelogram law”. CO1- R
12. Write the conditions of equilibrium of a system of parallel forces acting in a plane. CO2- R
13. State principal axis of inertia. CO3- R
14. What do you mean by impact of elastic bodies? CO4- R
15. Define Co-efficient of friction and angle of friction. CO5- R

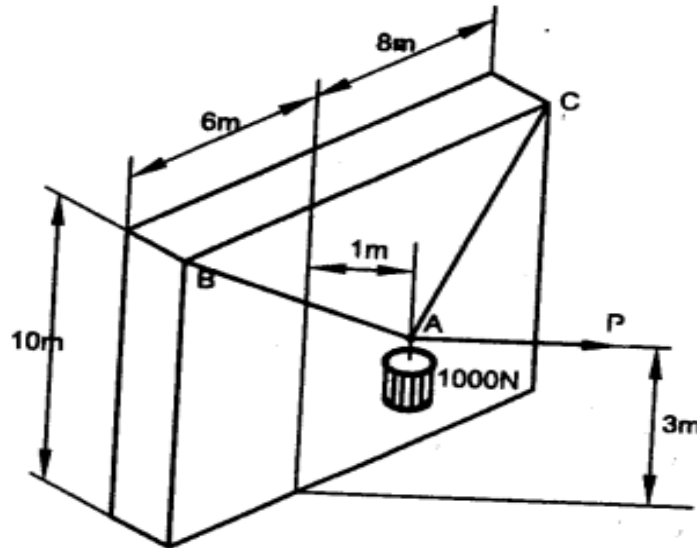
PART – C (5 x 16= 80 Marks)

16. (a) Figure shows a 10 kg lamp supported by two cables AB and AC. CO1- App (16)
Find the tension in each cable.

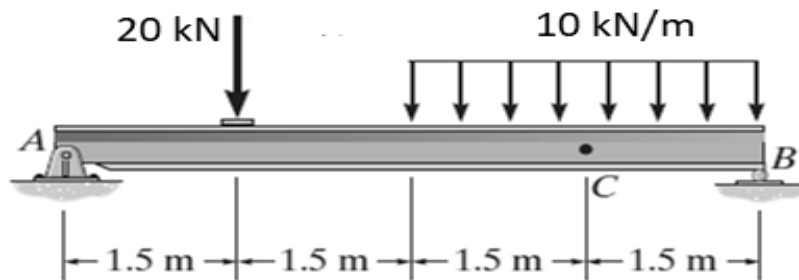


Or

- (b) A 1000 N cylinder is hung by means of two cables AB and AC, which are attached to the top of a vertical wall as shown in fig. A horizontal force P perpendicular to the wall holds the cylinder in the position shown. Determine the magnitude of P and the tension in each cable. CO1- App (16)

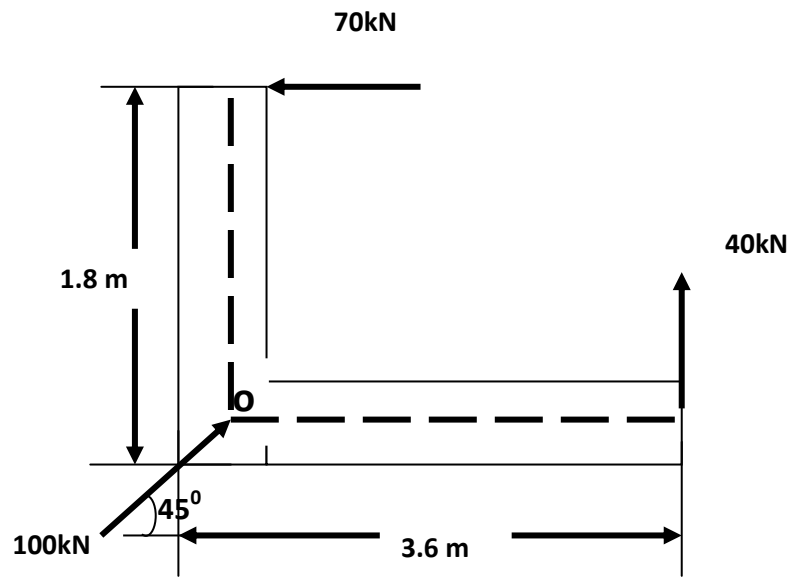


17. (a) Determine the reactions at the supports A and B for the simply supported beam shown. CO2- App (16)

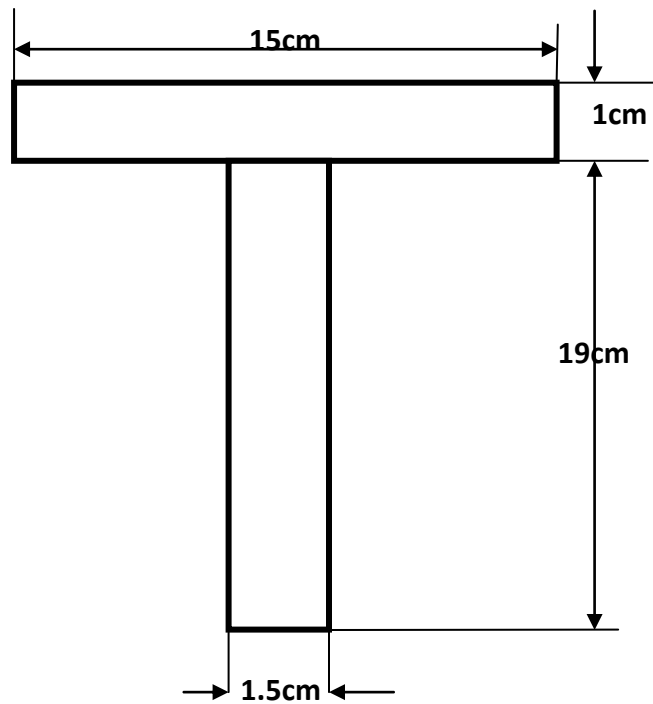


Or

- (b) For the force system shown in figure determine the direction and magnitude of the resultant from O. CO2- App (16)



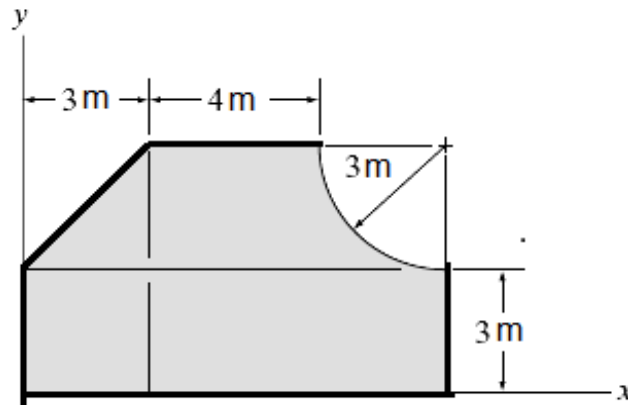
18. (a) Find out the moment of inertia and radius of gyration of the T- CO3- App (16)
section about its centroidal axis.



Or

(b) Locate the centroid of the given cross sectional area.

CO3- App (16)



19. (a) Two trains A and B leave the same station on parallel lines. The train A starts with a uniform acceleration of 0.15 m/s^2 and attains a speed of 40 km/hr when the steam is reduced to keep the speed constant. The train B leaves 1 min after, with a uniform acceleration of 0.3 m/s^2 to attain a maximum speed of 70 km/hr . When will the train B overtake train A? CO4- App (16)

Or

- (b) A ball of mass 2 kg , moving with a velocity of 3 m/sec , impinges on a ball of mass 4 kg moving with a velocity of 1 m/sec . The velocities of the two balls are parallel and inclined at 30° to the line of joining their centers at the instant of impact. If the coefficient of restitution be 0.5 , find CO4- App (16)
- (i) Direction, in which the 4 kg ball will move after impact;
 - (ii) Velocity of the 4 kg ball after impact;
 - (iii) Direction, in which the 2 kg ball will move after impact; and
 - (iv) Velocity of the 4 kg ball after impact
20. (a) A weight of 40 kN is on the point of motion down a rough inclined plane when supported by a force of 15 kN acting parallel to the plane and is on the point of motion up the inclined plane under the influence of the force 20 kN applied parallel to the inclined plane. Determine the coefficient of friction and angle of the plane. CO5- App (16)

Or

- (b) A belt is running around a pulley of diameter 600mm and develops a tension of 900N on the tight side and the angle of lap is 165° . The coefficient of friction between the pulley surface and the belt surface is equal to 0.15. Determine the power transmitted by the pulley when it rotates at 300rpm. CO5- App (16)

